

AVIATION WEEK

AUG. 9, 1954

50 CENTS

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From tin fish to censored

The TBF Avenger was built to deliver tin fish to surface ships. This she did with alacrity during World War II. She also corked harbors with mines, sought subs and sank 'em. The new S2F is more a submarine specialist. Filled with electronic gear that detects, plots, and pin-points an unseen sub, she can drop a *censored* charge

that will guarantee "point of no return" for the sub. The S2F is the latest of a long line of highly effective aircraft designed and built for the U. S. Navy.



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DESIGNERS AND BUILDERS ALSO OF COUGAR JET FIGHTERS, ALBATROSS
AMPHIBIANS, METAL BOATS, AND AEROBILT TRUCK BODIES



AVENGER

**8 reasons why engineers
chase constant frequency A-C
power for new jets...**

SUNDSTRAND



Recently, a staff of engineers was asked to analyze all types of electrical systems available and to prepare recommendations on the best system for a series of new jet fighters and transports. Of all constant frequency systems, of all other types of systems, the Sundstrand-driven constant frequency a-c system stood highest for these eight major reasons:

- 1 Reserve and Reliability**—Sundstrand's constant frequency a-c system meets all reserve and reliability requirements.
- 2 Less Weight**—constant frequency a-c power means savings of several hundred pounds of weight. These savings occur in generation, distribution, conversion, and utilization.
- 3 Greater Growth Capacity**—initial installation provides substantial load growth capacity, with further growth capacity available through the addition of an auxiliary drive-shaft motor unit.
- 4 Full Power**—full rated electrical system power, plus overload capacity, is available from engine idle to full thrust.
- 5 Greater Fault Clearance Capacity**—faster clearing, less structural damage where faults occur.
- 6 Simpler System**—power generation system has

only three pieces of rotating equipment in bearing brackets, commutators, and regulators—means less maintenance.

7 Fewer Types of Power are required, resulting in less confusion, simplified training, another stock of equipment.

8 No Beat Frequency between generators and alternators to cause unsatisfactory operation of service equipment. The Sundstrand-driven system is the only one in which alternators can be paralleled.

Get the complete story on how the Sundstrand-driven constant frequency a-c system proved itself superior to all other types. Ask us help you make an analysis of your power requirements. Phone or write our home or district office.



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NEXT GENERATION jets are now going faster, higher and farther. Landing gear must take off with the B. F. Goodrich airplane Tubeless Tire—first high-pressure tire of its kind in the world!

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The patented inner liner makes air leaks longer than conventional rubber. Edges molded on the inside of the tire level prevent air loss around the rim. On one-piece wheels, a rubber O-ring and keeps air from escaping through cracks.

Designed and developed by B. F. Goodrich, this new high-pressure Tubeless Tire has passed the most severe tests, including a special "barreling" test specified by the Navy. It showed the tire retained air even when compressed five to six times the normal flight load on the Grumman Cougar. Now Cougars are making operational flights with the new B. F. Goodrich in perfect development for use on commercial

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AUGUST 5, 1954

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Journal of Management Inquiry 20(4)

Mr. James Strassman, Vice Pres.,
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Toledo 1, Ohio

Dear Mr. Sturges:

Per operation of DC-8 and DC-8 aircraft
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to successfully operate conditions.
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at the altitude is only 600 feet above sea level,
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AMAZON'S FAVORITE
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DH Comet 3 Jet Transport Makes First Flight

Prototype de Havilland Comet 3 jet airliner is seen aloft on its maiden flight July 29. Financed by some \$2,000,000 through Public-Private Aeronautics, the trans-Atlantic transport made 54 nonstop flights.

cles at 7% strength. It is larger than the Cases 1 and 2 trans-
ports. The streamlined parachute falling from the leading edge
of the set back's nose was the big, as an auxiliary fuel tank.

Domestic

Navy's **Caspar** XPY-1, ventral-take-off fighter made its first free flight Aug. 1 at the Navy Air Station at Moffett Field, Calif. On the first flight, the VTO climbed to 20 ft and on subsequent flights attained 150 ft. Transition to horizontal flight will not be made until the VTO is moved to the Navy aviation air station at Brown Field near San Diego, Calif., where it will remain for the rest of its five-flight test program.

An **Aviation Super Constellation** crashed into a tree and burned to
 well during a whirling emergency
 landing on rough farmland eight miles
 north of Pontiac, Conn. All 37 persons
 aboard escaped death or critical injury.
 The transport, on a flight from Farm
 ington, was diverted to Boston by bad weather
 at New York.

Republic Aviation Corp. has purchased Fairchild Engine & Airplane Corp.'s 424-800-sq-ft powerplant facility and office building at Farmingdale, N. Y. Republic will use the building, near its own plant, to consolidate engineering and experimental operations. Fairchild's Engine Division plans to relocate in the Long Island area.

John C. Allen's resignation as Assistant Postmaster General in charge of transportation became effective last week.

"Thermal barrier" laboratory has been built by Northrup Aircraft at Hawthorne, Calif., to test new aircraft materials and finishes.

U. S. government has filed suit against Secy Corp. and Dr. W. L.

Harlow, the company's chief engineer, to recover the alleged share of income from a radio invention at issue was developed by Harlow while he was working on government-sponsored research at the Massachusetts Institute of Technology. Harlow later joined Spence and applied for a patent with five other scientists, assigning rights to the com-

Col. Robert B. Norky has been appointed assistant chief of transportation for Army aviation, succeeding Col. William B. Barker, who has been assigned as commander of the Transportation School at Ft. Rucker, Va.

Boeing RB-47E set a USAF speed record for bombers of 662 mph July 28, flying 157 mi from Oklahoma City to Wichita in 15 min 20 sec. The reconnaissance version of the supersonic Stratofort was powered by an General Electric J47s adapted for water injection.

Financial

North American Aviation, Los Angeles, reports a net increase of \$14,525,000 for the nine months ended June 30, compared with \$7,993,000 for the same period last year. Sales and other income totaled \$491,796,107, and backlog June 30 amounted to \$1,876,085,926.

United Aircraft Corp., East Hartford, Conn., had a net income for the first half of 1954 of \$13,265,384, up from \$12,330,314 for the same period of last year. The report includes earnings of Cessna Veight Aircraft, Inc., former UAC subsidiary that was separated from the company July 1 (AIRCRAFT WEEK May 27, p. 16). Backing at yesterday's close, \$1,175,000,000.

Fairfield Engine & Airplane Corp. reports net earnings of \$2,278,000 for the first half of 1994, compared with \$2,136,000 for the same period a year ago. Total sales for the six months: \$21,844,000.

Glenn L. Martin Co., Baltimore, has paid off a \$10-million loan negotiated with commercial banks in January 1988 to cancel its V-lane agreement, now it has all debt.

Boeing Aircraft Corp., Buffalo, N. Y., had a net income of \$1,409,584 for the first half of 1974, compared with \$1,681,010 for the first six months of 1973. Sales and income totaled \$93,532,772, a 24.8% increase over \$74,932,606 for the same period last year. Boeing's July 2 sales of \$427 million

Brennif Airways reports a net income of \$795,871 for the six months ended June 30, compared with \$125,612 for the first half of last year. Revenues were \$21,448,108, an increase of \$2,308,350.

Interventional

Virtual-telco projects are being developed by a number of British aircraft companies. Minister of Supply Dennis Sainsbury reports: "Substantial funds already have been spent on VTO research, with the amounts increasing steadily."

Canberra ML WS, a new version of English Electric's long-range bomber, has made its first flight at the company's airfield at Salisbury, England.

Dassault Mirage 4N, now undergoing flight tests, has reached Mach 1 speed in a dive.

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Air Defense

- **Wilson forms new overall Continental Command.**
- **USAF to be responsible for Army, Navy units.**

At Ft. Monmouth last week, we given complete responsibility for the country's air defense, with authority over Army and Navy units used in the defense mission.

The Department of Defense will activate Sept. 1 a new Continental Air Defense Command headed by Gen. Benjamin W. Chidlaw, who also will continue to act as commander of USAF's Air Defense Command. Head quarters of CADG will be in Colorado Springs, home of ADC.

- **JCS Declines:** The new unified command was recommended by the Joint Chiefs of Staff to:
- Provide for the development of coordinated plans and requirements for the continental air defense mission.
- Insure effective control and utilization of all available military strength—Army, Navy and Air Force—in time of emergency.
- Provide a single military agency to coordinate with the Federal Civil Defense Administration and other state and local agencies holding responsibility in case of an attack.

Practical effect of the change will be to give Gen. Chidlaw a direct channel of communication with JCS. After Sept. 1, Chidlaw will determine requirements for all three services. As commander of ADC he had the responsibility for air defense but no authority over participation by the Army and Navy.

- **New Weapons:** In recommending the change, Defense Secretary Charles E. Wilson declared that coordinated control was more necessary "to the advent of new weapons and increased forces available to continental air defense."

The Secretary noted new and faster interceptor planes and improvements made in the electronic field that will make air defense both more complicated and more efficient. He said it is important for the United States to be ready for present action if it is to take full advantage of new developments.

In order to do this, Gen. Chidlaw will have authority to issue orders and ships, similar to the power given to a fleet commander in case of war.

The general was reported, one month in chief of CADG to act for USAF as the executive agency. He will be responsible to USAF's Chief of Staff and Secretary (Shed) E. Telford.

• **Improved Operations:** Wilson made it

clear that transfer of the new command will not alter the role of the various air defense commands but will improve their cooperation.

"This is not a radical thing," Wilson said, "it is an organizational improvement." He added that some additional money will be spent on air defense, but the figures are not available.

Coordination of air defense activities by the three services in the past has been effected only by mutual agreement. If USAF believed that Navy missile launchers or guided ships were needed at certain points, it could only ask the Army or Navy to provide them and final decision rested with the other service.

Under CADG, the request will go to JCS if necessary to get action. One caveat: Army and Navy responsibilities have been increased to protect the race and weapons demanded by Chidlaw.

Army (element of the new joint command will be the Anti-Aircraft Command, headed by Lt. Gen. John T. Lewis. The Navy has not designated an admiral to command Naval forces participating in air defense.

McDonnell's Missile Backlog: \$12 Million

McDonnell Aircraft Corp., St. Louis, has a backlog of \$12 million in contracts for development and production of guided missiles, the company reports. Total backlog for missiles and airplanes is \$46,177,865.

Missile projects include ground-to-air, air-to-air and air-to-ground weapons, the St. Louis firm says. A major project calls for participation in development and production of the Talos missile system.

Talos is one of a family of missiles developed originally at the Applied Physics Laboratory, Johns Hopkins University, under a Navy Sea-Target Section T contract with the project name of Rembrandt.

Prime contractor for the Talos production is Boeing Airplane Corp.'s missile division. McDonnell's participation in the project may be in the role of a subcontractor to Boeing.

• **Sales Decline:** McDonnell also reports total sales of \$124,095,491 for the year ended June 30, down 2.81% from the previous fiscal period. The decline was attributed to completion of the F4H-1 Phantom contract and production shortfalls ordered on the F4H-1 and T-28B Banshee. McDonnell built 195 Banshees for the Navy.

Revenue after taxes rose \$5,621,417 or 55.0% a company statement.

The report also made:

- Delivered contracts on the Navy's F3H Phantom and are scheduled to be

through 1957 and 1958. Beginning with the F4H-1 Phantom, improvements in software and equipment will be in effect, including the Phantom F-4 jet engine with 9,500 lb. thrust. The version of the Phantom will be designated the F3H-2N. Present version was produced for three months due to engine difficulties.

• **The Army Air Force:** NV-1 converts plane is undergoing flight test, and to reach a conclusion on the XH-34-4 engine engine or living engine for the Navy.

• **The company:** nearly has completed a new building with 500,597 sq. ft. of space. It will house a 10,000-ton hydraulic press.

New Assistant USAF Secretary Nominated

Eric S. Carlock, deputy comptroller in the Defense Department since 1951, has been nominated by President Eisenhower to be Assistant Secretary of the Air Force (Management).

Carlock would fill the immediate vacancy left by the resignation last month of Lt. Col. White (Aviation Week June 28, p. 17). Under the USAF reorganization plan approved by Congress, the post will be divided into two new jobs. Previous deputy assistant Carlock informally will be named Assistant Secretary (Financial Management) under the new setup.

Other duties covered by the present office will be vested in a new Assistant Secretary (Manpower, Personnel and Reserve Forces). These have been no indications who will be named to fill this post.

Carlock, 47, is a native of Walnut Grove, Minn. Employed in the defense department since 1945, his career there has been devoted to budget defense activities.

Firestone Plans New Guided Missile Plant

Los Angeles—Firestone Tire & Rubber Co. plans to build a \$25 million plant here to increase production of the Army's Corporal guided missile.

The 150,000-sq. ft. plant will be adjacent to the Firestone tire factory and will be used solely for missile production. Plans call for the building to be completed in about five months.

Leonard K. Hartzog, president of the California Division of the corporation, stresses the Corporation is a machine-to-machine capable of making other types of high explosive warheads. It is an electronically directed weapon fired from a mobile launcher.

The missile already is in production at Firestone's present plant here.



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Is F-104 Mature Light Fighter?

Prototype's high performance indicates it represents a fully grown version of the lightweight concept.

By William J. Gough

Los Angeles—Overlook of Lockheed Aircraft Corp.'s prototype XF-104 has brought to light an interesting new Air Force view on the lightweight fighter concept, a subject debated hotly not only within USAF headquarters and the industry but before the public as a number of national magazines.

The few facts available on the F-104 (Aviation Week Feb. 12, p. 15) indicate it could be the concentration of the lightweight concept that our high Air Force officer feared during the Korean war, which he said:

"I think our greatest weakness for getting new fighter aircraft through the design stage and into combat there will evolve a lightweight fighter that will evolve a lightweight fighter that will fail to live up to the new concept."

"Nevertheless in the design and production stages, we will meet the requirements, our safety programs, our way of designing a fighter for men, find one operational limitation and our maintenance, upon such emergency vehicles will compromise the so-called lightweight concept. The result will be a 1954 F-86."

Since it is a 1956 and the XF-104 stands as it all about the same combat weight as the F-86B, his remarks seem to be most timely.

Full-Grain Concept—But those same remarks also indicate that the F-104 might be a lightweight fighter which, although it is not a stripped-down bird, has performance so high that it represents the lightweight concept grown to its full maturity.

Its potential performance is said to be almost double that of present fighters of the Korean vintage.

The new Lockheed aircraft is just the latest mass Korean fighter pilots were lobbying for after their return home. The new requirements for its design, Clarence (Kelly) Johnson, Lockheed's chief engineer, never saw a better in the stripped-down school.

If the F-104 proves as successful as the Barbed compass believes, however, the new aircraft could bring radical changes in U.S. fighter strategy as well as production techniques.

One thing is certain: The Lockheed entry must prove itself to both sides of the lightweight controversy—those who do not believe in the lightweight concept under any circumstances and those members of the "strip it down" club who fear any compromise.

Combat Born—The controversy has been in the making as far back as MIG Alley during the early days of the Korean fighting. U.S. fighter pilots had begun to report that Lockheed's MIG 15s were outperforming their F-86 Sabres in several important combat characteristics. The MIGs, they said, could fly higher and climb faster.

The reason: The Sabres was too heavy. Two more, pilots were adding weight and complexity to U.S. fighter planes, they said. Hence, then, like electronic gauges were cutting down the performance of the Sabres and then failing to operate at crucial moments.

Four combat experience was enough when some U.S. aircraft designers had learned as the light aircraft complexity. Despite the 15 in 1 superiority of the Sabre over the MIG, the Pentagon was loath to increase the number of the Korean war. They demanded Air Force to meet with demands for a stripped-down fighter which could climb higher and faster than a MIG 15 and which could outperform it in all respects.

These demands for a hybrid aircraft boiled over into public view as the articles in *Look*, magazine's "Red Jet Can Rule the Skies" and Collier's "Select Gauges—Do They Kill One Fighter Pilot?"

One of the leaders in the movement was one of America's most respected aviators, Col. Francis Gabreski. He was also supported by other top men.

ARDC—But the air and ground service implications far beyond the purely military aspects of the Korean war. The Air Research and Development Command considered the results on such items as the under pressure's direct attack on its research and development themes and its indirect blow at the philosophy under which ARDC was set up in a separate movement.

And at least one officer was quoted as saying: "The big problem is to get a good plane design past the Air Materiel Command. It almost seems the ARDC automatically finds a design is too good unless it is loaded down to the hilt with such gadgets."

In general, those who argued for a lightweight fighter wanted to cut down both the weight and complexity of our current fighter aircraft. This is what they wanted:

- **Superior performance**: Higher Mach, higher service ceiling and higher rate of climb than a MIG 15.
- **Ease of maintenance**: Elimination of such complex features as the AECM and A-1 electronic gauges.
- **Capability of inexpensive, with some production to meet Russia's expected number of MIG 15s and improved MIG types.**
- **Ability to operate from forward landing strips—short field performance.**
- **Lighter planes from the Fourth and 1st Fighter Interceptor Wings in**



Rocket Copter Can Be Flown With One Hand

Small, single-seat RHT-1 "Prohawk" one-man rocket-powered helicopter could meet its pilot with one hand. Last week of the RHT-1 shows some changes on pilot's position carried at Aviation Week (Feb. 12, p. 9). A small, adjustable horizontal stabilizer

has been added for better support and better from the rotor hub support part to the front of the landing gear struts have been removed. Support just has been loaded up to compensate for the deletion of boom. Research of such studies is an important weight saving and simplified the structure.

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Korea filled of a lightweight fighter in terms of perhaps 10,000 lb. fighting weight, a speed of slightly more than Mach 1 and a fighting altitude of 10,000 ft.

► **Versatility** Needs—the critics of the lightweight philosophy had not missed for this. "We are asking for a plane designed to fight against a specific aircraft in a 100-mi wide strip of air just south of the Manchurian border."

"The U. S. cannot afford to build a plane that is specialized. We must be prepared with aircraft versatile enough to fight anywhere in the world against anything the enemy can put up against us."

These critics also pointed to the terrible toll taken at the F-86 over the MIG and mated. "There was no reason that in view of your argument," The MIG is two tons lighter and is losing the war."

► **Ready Answer**—Fighter pilots of the 14th Air Force, plugging for the light fighter, had a ready answer.

"This argument has been gained in spite of, and not because of, the rapid combat," they said. "The enemy was consistently outmaneuvering his opponent by exploiting his numerical advantage and the high-altitude performance of his opponent."

Besides, there could be no question about the superior ability of U. S. fighter pilots in Korea, particularly against the Red second string which was using Korea as a training ground.

When Thomas—"The F-100 and its successors were periods for the first time in history, the arguments for an American fighter pilot to look down at the enemy," and our high-ranking officer. "However, the limited number that can be produced because of their great cost and complexity cannot possibly satisfy our stated commitment. We cannot conclusively assume that 100 fighters can always successfully contain 1,000."

"To meet this threat to our future security, we must be prepared to match the enemy not only in combat but in quantity. We must build versatile specifications that provide multi-purpose fighter aircraft. We must build a great force of supercharged fighters instead of a few head-trilled custom-built machines. This can only be done by the addition of a simple, low cost, mass produced, high performance fighter."

► **MIG Match**—These men did not underestimate the ability of the Koreans to turn out aircraft of exceptionally high performance. But for the next 10 years the bulk of the Red air force would be made up of MIGs and improved MIG types in great numbers.

Certainly the U. S. needs aircraft of high quality to battle the Koreans. "First build" aircraft but it also needs an aircraft that could match in quantity

the swarms of MIG types, it was argued. This was to be the lightweight fighter.

The concept was condensed in two paragraphs. "It doesn't pay to design and produce an aircraft which is superior to a MIG by a few miles per hour and only a few thousand feet in ceiling, the opponent said. An attempt to load U. S. designers down the path to building superior MIGs could be fatal to U. S. air strategy, they warned."

► **Gunsight Headache**—The arguments often centered on the F-86 radar gunsight, both because it was complex and because it was vulnerable. There could be no question that adequate logistic support, poor maintenance training and lack of pilot familiarity made the radar gunsight more of a liability than a help in early days of Korea.

It was no surprise that early returns from the first Eastern combat theater pleaded for a return to the "cheating gun" on the world's best type of gunsight. The percentage of missions on which the gunsights were inoperative was so high that what really was surprising was the fact that demands for their removal were not successful.

But the gunsight stood in. Gradually, an about turning and logistic effort resulted in a high in-commission rate that made the sight very acceptable to fighter pilots. In the latter days of the Korean conflict, in the last year of the Yalu River fighting, it was hard to find a pilot in Korea who would fight against the A-1 gunsight—even in a lightweight fighter.

► **Concept Shift**—Although some of the lightweight advocates continued to argue against such items as the radar sight on the basis of its poor performance in the early part of the war, it became apparent that some shift in the lightweight concept was inevitable.

If the lightweight fighter was to be mass produced, it would require a mass-produced pilot. "There obviously could not all be trained from here who could score in superior combat with 'them' we gave on the mainland," Bern the lightweight aircraft would have to be one to which an average pilot reasonably could accomplish his mission.

It is interesting to note that the F-104 contains a radar gunsight. This alone will be enough to make some of the lightweight philosophers unhappy.

► **Conceptualism**—An aircraft design is a series of compromises. Weight is a deterrent to such factors as armor, more pilot safety, range performance and safety. So many choices centered in the USAF lightweight concept.

These choices are embodied in the F-104, both in a line that never be faced in the stripped-down philosophy to start with. Lockheed's "aluminum silver" is designed to have the best of the Russian, an expected in production the very first ahead. This is not as

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secretly named at the Red second team.

The XF-104 is not a stopped-down version, although it is lighter than its predecessor in its performance capabilities. This is expected to be a fighter fighter, with high kill probability due to its superior performance.

Estimates of its speed capabilities, vary from 1,800 mph to 1,700 mph. There can be no question that with its afterburner engine it will be well over Mach 1, perhaps near Mach 1.5.

"This aircraft really has to take a back seat to any of the big jobs in either performance or disposal," predicts an Air Force source.

► **Double Strength**—At the same time, the lightweight concept of construction, simple mass production has been retained.

Depending upon the use of the two-dimension order, the F-104 could cost less than half of what some of the heavy-weight fighters cost, according to one source. This could mean double the fighter strength for the same budget expenditure.

Before you nod your head at that, consider a question already troubling some Air Force officers: How could USAF fit so many aircraft into its present wing structure?

► **24-Hr. Fighter**—The XF-104 contains the small features for pilot safety, such as an ejection seat, although reduced in weight to meet mission.

It has been described as a "24-hr. fighter," so some thought has been given to all-weather operation. The instrument panel although small and simplified, has provision for instrument landing equipment. Range and armament are said to be better than those of U. S. fighter planes that fought in Korea.

In appearance the XF-104 definitely resembles the arrow-shaped Douglas X-1 research aircraft, a resemblance emphasized by its stubby, thin wings and long, spear-shaped fuselage. The wings are placed so far back that from the cockpit it is possible to see only the tip.

The aircraft's appearance indicates it probably will require a field length close to that of present fighters despite the increased thrust available at considerable height.

► **Redesigned**—Change—The XF-104, heavier than other lightweight proposals, is neither fit nor built in terms of the lightweight segment first noted during the Korean fighting.

It will be interesting to see how it stacks up performance-wise, not only against such heavyweight aircraft as the F-105, but against such lightbuds as the Douglas A-1.

The answer could result in some radical changes in the U. S. fighter picture.

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Flying an Indo-China B-26 Strike

Correspondent rides with a French mission before the cease-fire, reports FAF hit Reds only half the time.

By A. W. Jones
McClure 210 World News

Huephang, Indo-China—French Air Force lead us positive as for exposure against Communist Vietnamese troops, despite nearly eight years of jungle fighting in Indo-China.

FAF's striking force of World War II aircraft killed some Reds and destroyed some Vietnamese supplies. But the air strikes also damaged local Vietnamese, destroying villages and killing families of people fighting alongside the French.

► **Locally Missions**—Shortly before the cease-fire became effective, I flew with the French on a bombing mission against a battalion of Vietnamese rebel regulars holed up in a village a few miles from the Communist headquarters at Vinh. We did some good.

It was a lucky mission: a single B-26 carrying eight 250-lb. high-explosive bombs.

We took off from FAF's Cat Bi base on the outskirts of Hanoi and streaked south across the delta into Red-held territory. One hour after takeoff, we completed the third and final deep-bombing run on two key points in the treacherous village. As we swung around, two of three secondary explosions shook the village, indicating we probably had reached all a small Communist-held or ammunition dump.

► **Poisoned Village**—The day before, it was different. My pilot, Capt. George Gohy, who was France's highest decoration flew with the five French bombers in World War II and who learned his deep bombing techniques last year at the U. S. Air Force's base at Fort Monmouth, N.J., led a flight of 20 bombers against a small, supposedly Vietnamese-held village smack in the middle of the delta.

The village was only five miles from the city of Ha Dong, about halfway up the railroad to Hanoi. From it, the Communists were believed to be making the railroad.

Twenty bombers flattened the village. There were no secondary explosions. Only a small cloud of dust and a few small fires remained at a mid and down town. The pilots believed they had pulverized one more quiet village in the delta.

► **Evade Target**—But as they hit Communists only half the time. The trouble was that the French and Vietnamese ground forces were unable to hold the Reds within easily definable target areas.

The delta, for example, consisted of some 4,000 villages. More than half

were held by the enemy, and another group was neutral.

But no one was sure from one day to the next which villages held Reds and their supplies.

► **Safe Strike**—Reaching outposts in the delta or to the south around Vinh were simple and safe.

The single B-26 strike did not shake above 4,000 ft., and for a long way across the delta we stayed around 3,000 ft. The 10-bomber mission was flown about the same way. The bombers went across the target at 2,000 ft.

Tonkinese were hit with light armor fire in the delta area, and some light bombs were shot down by Communist ground forces.

On the rim of the delta west and north of Hanoi, the danger was greater. The Communists had moved more than 100 17-mm. submachine guns into this area from Thanh Hoa.

Red planes shot down one B-26 and four B-29s during the week to last week of fighting. The B-29s went down only 10 miles from friendly troops, but the French were so short of helicopters that it was impossible to pick up the survivors.

► **No Push**—In addition to three B-26 squadrons right between central and north Vietnam, the French used two squadrons of F4F Corsairs, armed by Fiat Air Arm squadrons of F4F Hellcats and F4U Corsairs.

On good days, each squadron mounted 21 sorties. Usually, however, the number was much less. There was no push and drive home or at Binh Mai, near Hanoi, comparable with that of the U. S. fighter groups in Korea.

It took close to two hours to get a





BOEING 707 PROTOTYPE, in yellow, brown and silver, has reached 42,000 ft, completed 110 mph, in early stage of flight test program.

Final Cost to User Influenced 707 Design

By David A. Anderson



AT THE CONTROLS—L. A. Storgis, senior flight engineer's station of new Boeing jet transport prototype in pilot "Yan" Johnson and copilot Richard L. (Dr.) Louch look on

Seattle—Low maintenance and operating costs were the ultimate goals of the engineering that produced the Boeing 707 jet turbojet transport prototype. Whenever there was a fundamental design decision to be made, it was resolved on the basis of final cost to the user of the plane.

For this reason, the basic design of the airplane is simple in construction and structure. The lowest maintenance cost the airplane is built like the 18-year-old Stearman.

But careful integration of engineering effort plus the tremendous Boeing background on large jet aircraft has produced a modern transport with the performance of many contemporary military aircraft.

► **Painting**—If you walk around the airplane with the intent of studying its technical composition, you are continually diverted by the biggest eye-catcher of all: the color scheme.

The scheme is colored in canopy yellow, silver trim and what has kindly been called chocolate brown. [It is none of a browned copper bronze to these eyes.] Completely painted by the light

of the plane against clank or rattle, the color scheme apparently was disliked by many of the Boeing people at first. It has since grown in their favor.

Wellwood [Dr.] chose one paint test, explained at this way.

The engineers decided the plane had to be painted to protect against corrosion. We felt it ought to have a high-colored top for good reflectivity. We also wanted to avoid all the standard color combinations of white top with red or blue trim, so we didn't want to pick an airline's color scheme, and we wanted the final result to photograph well in black-and-white and color. So we talked to Walter Dornan, Texaco and some of our own specialists, and we kept coming out with yellow and brown.

It might be pointed out that Boeing's new flight test barge has some of its offices and conference rooms painted with brown walls and yellow ceilings and overhead structures as a result of studies made by Boeing interior specialists.

Plane Details

The simplicity of the Boeing airplane is emphasized by its construction. The 90-ft. covers has a completely clear floor, and there are no structural bulkheads protruding inside the main cabin. Just aft of the flight engineer's position, a platform and office equipment extension extends a foot to the floor. Positions for three test engineers are directly behind the platform.

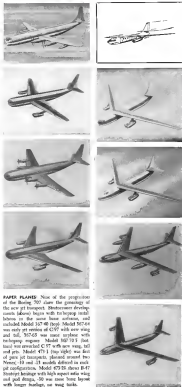
Soundproofing and a light gray-beige interior fabric have been installed. There is a few bag window " " just to keep the flight test boys from getting claustrophobic.

Boeing's intention for production airplanes is to install a long series of many windows along each side of the fuselage. The way these will be at least one window by each outside test, regardless of the spacing used in the interior arrangement.

► **Passage**—5 seating, construction is composed of two circular arcs of different radii and centers, level into a smooth contour. Floor has a built-in crease of the upper knee, which places the armrests with just about a level with passenger's elbows. Floor width is greater than the Stearman's, but the ceiling height is less.

► **Passage structure** is a framework of simple rings and struts, says George Martin, Boeing chief engineer. The floor is supported on simple I beams, which also provide additional structure to take the pressurizing loads.

Below the floor level are cargo compartments, with about five feet of headroom. In a takeoff/landing job, this space would presumably be taken up



PAPER PLANES: Nine of the proposals of the Boeing 707 show the simplicity of the new jet transport. Stearman development (above) begins with no wing until below in the same basic airplane, and included Model 167-40 (top right) Model 167-41 was only jet version of C-97 with new wing and tail, 167-42 was main airplane with no wing engine. Model 167-12 is jet, Model 167-13 was C-97 with new wing, tail and prop. Model 167-14 (top right) was last of jet jet transport, placed around two 167-15 and -16 models differed in engine configuration. Model 167-17 shows B-47 transport layout with high aspect ratio wing and god wings, -50 was most basic layout with longer fuselage, no wing tanks.

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ASSEMBLY FEATURES for the 707 were designed for construction of one airplane in this place. Stairways and walkways facilitate movement of workers over entire building area.



WING TAKES SHAPE as assembly begins. Diagrams (left) show wing, control section of leading edge, and air frame. Control tracks for wing flaps are located ahead.

by tail, leaving the space below the flap for additional cargo.

► **Wing Flap-Built** with 15 degrees of up-curve at the quarter-chord point, the wing panels of the 707 have a tip chord of 9 ft 4 in. and a root chord of 18 ft. Thickness ratio increases rapidly near the root. Spanwise of each panel is 65 ft, but the 7-degree dihedral reduces the overall span 150 ft 8 in. Spanwise centerlines are at 25 ft, 3 in. and 41 ft 1 in. outward of the airplane center line.

Total wing area is 2,490 sq. ft.

The wings are built around a simple box-girder structure, Machinist David Wilson, Whittier, Spain, says, as far as possible to get maximum space for fuel, carried in two integral tanks in each panel.

Center section of the wing is continuous through the fuselage and contains space and provision for additional fuel in baggage hold.

Flaps are in two separate sections, and are a double-slotted type of very large chord. The flap travel is aft and down, so that considerable area extension is obtained, as well as increased effective camber and controlled surface through and over the flap. A section of the wing underside just ahead of the flap wings upward to lie in the surface when the flaps are deflected.

► **Lateral Control**—The Boeing-developed lateral control system allows to have all the answers to the problem of control over a very wide speed range.

► **For high-speed flight**, where adverse effects could wear the wings enough

to cause complete reversal, the designers have specified upward uplocks.

► **For low-speed flight**, where the ability to pick up a wing positively and quickly with the stick is greatly to be desired, wingtip ailerons have been provided. They only operate with the flaps extended.

"Fuselage," small carbon located well inboard between flaps, operate like ailerons, and start to trim the plane and to feed stick inputs back to the pilot.

During the approach, the spoilers can be fully extended to act as airbrakes, control function is taken over by the ailerons.

Near the wingtips on the under surface of each panel is an NACA duct type of duct inlet with a screen over the duct inlet. This is the vent for the wingtip tanks, and the design is such that the inlet supplies positive pressure on the vent.

Emergency fuel dump chutes are situated in the wing, and are actuated by their aerodynamic shape which pulls them out of the wing once the cockpit control is received.

► **Driver's Seat**—The cockpit layout and appearance is about as simple as can be incorporated in a transport type, and it owns this sophisticated appearance to careful planning and design. Because workmanship of the Boeing of Automotive Engineers administration cockpit standardization was closely followed. The result is a neat, attractive, spacious appearance more reminiscent of business plane than of a transport.

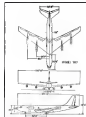
There is one non-standard installation the Boeing footrest, which has become a cockpit trademark since the 717. It's a simple transverse bar above the rudder pedals, and has been received so well in the past that Boeing felt the SAE wouldn't mind this time.

Behind the cockpit's partition is the flight engineer's panel, which can be operated either by an engine control at a facing chair, or by the co-pilot, in which case the panel can be swung around a vertical pivot to become more accessible to the co-pilot.

Emergency landing door on the port-type is in the fuselage side just below and behind the pilot's position. Side panel is blown off by pressurized nitrogen, and the crew can escape through a hatchway and well.

Visibility from the cockpit position is very good, both engines as a side can be seen. Down-visibility over the nose is comparable to contemporary transports and perhaps a little better than some.

► **Forward-View**—The Four Pratt & Whitney JT17 turbojets are located in single-entrance pods whose design is based on that of the B-52. Contribution of the stream is perpendicular to the wing chord plane,



707 LIMS shims in flow-view during

so that the engines have an odd, third look when the plane is on the ground. Mechanics working on the engines between ladders needed only standard footstep ladders to get all around the higher outboard pod. The inboard pod mounts the engine a little above eye level, and most of the attention can be reached without having to use any kind of a ladder.

Engines installed in the 707 are actually designated T17, for their simplicity. Pratt & Whitney use the commercial designation for the JT7 engines is currently JT1A, but the specific engine shipped to Boeing for the 707 were marked as 7 models for convenience in bookkeeping.

The only design change which is required a policy decision after the 707 was well underway centered around the powerplants. Originally Boeing engines called for dual-engine pods, installed after the B-52 and B-47 units. Two reasons caused them to change their minds.

► **Possible contamination** of a good engine by the bad one in the event of a single engine failure is a dual pod. That has happened in the past with at least two military aircraft—one is, at present, the B-47—when one engine failed.

► **Airframe's design** for abnormal accessibility to the engines for maintenance.

Weights engineers figured the added weight attributable to the extra access and door would be about compensated for by the decreased wing structural weight coming from the better distribution of stress loads and the reduction in wing loading increase caused by the outboard nacelle.

Some of the airplane's systems have been left off the prototype, but will be installed and tested when the time is right. The prototype system, too are

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BOEING OF 707 transport is shown in late construction stage at Boeing ship



EARLY DESIGN STUDY of the 707, based on B-52, showed swept-back wing. Note similarity of post wing and horizontal tail



FLUTTER MODEL of the 707 used in high speed tests is final point of interest for some of Boeing's top engineering officials

considerably different from possible fuselage production options

Reverse thrust, still almost ready for static tests at Boeing, will be installed in the not-to-be-future Boeing development of this type was described in *Aerospace Week*, Aug. 19 p. 18

flaps that instruments could never pick up."

Schauer added that one trouble with flight test instrumentation was that it was generally used after the fact instead of before. "We put those in after the fact but detected something and gave us options, and then we check the flight data and find out that we were right after all," he said.

In the fourth flight, Tex and Div had added other variables to their crew. A. L. Boring, project flight test captain, and two other flight test engineers were the first passengers—working ones, nonetheless—to ride in the new transport.

Boring estimated that by mid-April a cabin that would have 90 ft of room on the 707.

Windtunnel Work

Part of the design backlog on the Boeing 707 is an extensive windtunnel test program that cost the project in the neighborhood of one million dollars.

John Russell, Boeing's chief of wind-tunnel, and the 707 models had been in the tunnel for a total runway time of 1,537 hr., of which probably more than half was actual runway time. The rest was accounted for by model mounting, set-up time and other necessities. This is actually a small amount of testing compared to the 7,000-hr. mark of the B-52 tests and 7,000 hr. on the B-47, but that earlier experience paid off in reducing the number of required by wind-tunnel solutions necessary during the 707 design.

Four basic test models were built and one was later extensively modified, so that in effect, five models were tested. Longwood model of conventional construction for general stability and control tests and demonstration of some aerodynamic properties.

High-speed model of conventional construction for tests in the Condit Aeromedical Laboratory. This model of about 4 ft span, was parked in the bow and section of the 707 for later evaluation. The model was suspended at the tail cone with a wing balance, so that some modification of the external loads had to be made.

High-speed model built around a short one for 30 in. for Boeing's own use. Wings of this 7 ft model are largely solid steel. Controls are actuated remotely from outside the tunnel. It is mounted on a van five and long "B" frame rather than on struts as a wing.

High-speed model with pressure-sensitive instrumentation, the same model as above with an extra set of wing panels for pressure distribution tests. More than 200 hole holes were drilled into the wings at desired points.

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American Leading Airline **AMERICAN AIRLINES INC.**



EXPLODING UP A STORM-lashed starboard nacelle slips up late Washington term.

and connected through tubes to manometers to read the pressures.

► **Factor model, made of aluminum and brass for tapered ducts tests.** This model has complete dynamic similarity to the full-scale airplane, achieved by the use of internal weights and methods of isolating vibrations.

In spite of the great differences in model size, complexity and construction, they all rest about the same. About \$300 shop man-hour are invested in each model, with about the same time allotted to engineering and design. A civil model investment was estimated by Russell and Philip Whitener, head of the model design group, at about \$100,000.

► **Model Design—Whitener explained one of the design details used by his group in the construction of wind-tunnel models.**

The lightweight model for transonic testing is built around a rigid steel core, with model sections of aluminum and light-gauge forgings. The wing joints, which must take a total lift load of as much as 7,000 lb, are all steel construction, and usually solid.

It is possible to mount large sensors and the delicate signal of sensors by sensitive instrumentation, a strain-gage balance system is used for the large moment tests. They are also able to make precise measurements in the nose on the underside of the "belly" for example, but on a limited scale. Most of the pressure-distribution data comes from the modified model with special wings.

For tests in the Boeing full-film transonic tunnel, which has an NACA variable throat with modifications credited to George Selver, the ideal amount was developed. It is a thin sheet of metal which follows and follows to the under contour of the model being tested, then is mounted to the basic

floor in the test section. Boeing engineers say such a mount has very low interference in the transonic regime.

► **Factor Model—A second model is built for the latter tests, made at low speeds in the nearby University of Washington tunnel. Wings and tail are divided into separate strips, built up of brass and laminated in an aluminum skin. Each section can rest independently under dynamic conditions which appear better in a model environment than in a full-scale test. Small weights can be inserted in the hollow strip sections to simulate very strong structural stiffeners or fuel tanks in the wing tanks.**

Whitener showed *Aeromax* Wings a "Lateral" spar, used in models where the full-scale wing possesses stiffness to go great to simulate with solid spars of rectangular section. A continuous series of diagonal stiffeners is called into the spar of the open to provide stiffness. Whitener said that they had been able to lift the scale stiffness within 5% on design of the model. In the case of the 707 model, the body spar is built this way, but the wing is not.

Whitener's group is about 10 people, backed by about 100 technicians working in a large and efficiently equipped model shop. Another separate group of 15 engineers handles electrical instrumentation for the wind-tunnel tests. These figures are current full strength, and all the cases were obviously not assigned to the 707 design.

► **Boeing Tunnel—Boeing's transonic tunnel, in part private facility of its type in the world, was recently modernized and has a future potential for super-sonic development.**

George (father of the tunnel) is the use of laminated glass plate blades on

the 24-ft diameter fan which stir up the wind.

Models can be tested on any of the conventional types of supports: sting, wind plate, two, or three static and rot for test the models.

Most of the tunnel time is occupied in transonic testing or subsonic testing in the high-speed range, supersonic work is generally turned out to the U of W tunnel.

Boeing has not yet succeeded to the automatic data collection and reduction machinery installed in many tunnels. Instead they work in the traditional fashion, calculating and plotting data points by hand. They use continuous plots for checking as they test.

Current tested operating costs are estimated between \$500 and \$1,000 per testing hour, less for occupancy taxes. ► **New Techniques—Boeing has developed a method of building aerodynamically similar models out of metal, posing down thin thickness and the strength of metal patterns. Whitener said that the steel frame of an other work in this area, and felt they could clean a Boeing test.**

Metal bonding techniques are used for fastening the model together. But before the model can be glued, the strength of each part must be determined and correlated with the strength of the proposed glue bond area.

None of the 707 models has been built in this way, the technique has been applied to studies during actual.

Design Approaches

One of the largest efforts during the major 707 program was devoted by Boeing staff members at the various military, jet and flight-simulation groups and Civil Aeronautics Administration.

► **Two-Way Street—This quickly became a two-way exchange of information as Boeing consulted these groups, they asked for opinions on just about every phase of design and operations, and gave their own ideas in return.**

One of the first projects was a general document prepared by Boeing engineers on the characteristics of jet transports. It was basically a study of performance at various gross weights and other parameters without tying that performance too specifically to a particular airplane.

Some information had to be made, otherwise the document could never have been finished. The basic data was to answer a constant state of threat to wing area (TS) Wing sweepback was assumed to be about 15 deg, there were to be two 10,000 lb engines and the wing area was assumed 2,500 sq ft. Thus, this document like the 707, but at the time of the document, the de-

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governing design factors. Maximums simplify our analysis.

Economic goal for the design team is to be an economical cost not to exceed the lowest critical cost value figure shown in the CME report.

"Management kept its hands off the project," said one Boeing spokesman. They just told the team how much money they had, and what they were supposed to produce with it. From there on the project was on its own."

In recent times, Boeing employees reflected the big pit and got it into the air for its first flight (Aviation Week July 26, p. 14).

Weldable Titanium Alloy Sheet Available

A weldable, high strength titanium base alloy sheet has been announced by Nucor-Titanium, Inc., a product line item. The new alloy, Nucor-Titanium 1130T—contains 5% aluminum and 21% ni.

Good to be readily welded with the same techniques used for commercially pure titanium, this alloy is expected to have excellent ductility in large welded joints. The manufacturer notes the grade has a minimum tensile strength at room temperature of 115,000 psi, increases to 125,000 psi at high temperatures better than any other titanium base alloy.

The Metallized Ti, manufacturers also announces new fabric tolerances for titanium sheets of .015 to .016 inches and over.

•Commercially pure, 36 in. wide and under, (25%); over 36 in. to 48 in., (15%).

•Alloy, 36 in. and under, (15%); over 36 in. to 48 in., (15%).

For sheet under .015 in., the com-

pany has announced three tolerances:

•Commercially pure, 36 in. and under, (35%); over 36 in. to 48 in., (15%).

•Alloy, 36 in. and under, (15%); over 36 in. to 48 in., (15%).

OVERSEAS SPOTLIGHT

BEA Likes U.S. Copters

Two large helicopters flying in the U.S. come very close to meeting British European Airways' specifications for a passenger aircraft, says Lord Douglas of Scotland, according to the Manchester Guardian.

"America is ahead of us in this field," says BEA's chairman, so it may well be that we shall have to buy American to get started."

BEA wants a 40- to 50-passenger copter, with at least two engines for safety, and a speed of 150 mph. The U.S. craft he is referring to would appear to be the Sikorski H-35 and the Sikorski HO4S.

In three or four years, Lord Douglas expects Continental competitors, who will want to bring large copters into London, to force BEA to offer similar service. Present copters are too small to be economical, he says.

Copters for Australia?

The proposed policy of weakening the Australian fleet is seen in favor of the RAAF's maintenance strong appearance but will probably also be reconsidered in the near future, *Aviation Week* has learned.

Need to strengthen air defenses will be stressed with recent in-

crease in the number of air attacks and the possibility of new air attacks against the Pacific Islands. Decision to use copters against pirates would, however, be a possibility, said, in Australia has few of the resources.

New U.K. Avgas Plant

Imported, an important constituent of aviation gas is to be produced for the first time in the United Kingdom in a new \$1.1-million plant South Devonian Co. is building in Chichester. Until now, Britain has imported its requirements to the plant is scheduled for completion early next year.

How Fares Compare

At times in Australia are among the lowest and the highest in the world, according to the International Civil Aviation Organization. At the low end of the scale are fares of \$7.50 for a one-way flight, but some airlines charge under charge four and five times that amount.

The world's average is \$8.35, probably because of the effect of the U.S. contribution—half the world's total of passenger-carrying U.S. aircraft, combining first class and tourist, is 3.6 cents per passenger mile.

Gypsy Queens Live Longer

British authorities have extended the overhaul period for the Gypsy Queen 70-1 and 70-2 (types) to 1,800 hr. from 800 hr., according to the British publication, *Military Transport*.

More than 1,800 Gypsy Queens have been built, of which 1,200 are certified as fly. The Queen 70-1 is used in the air force for the extended life of the Gypsy Queen 70-2, which powers the Helix.

Italian Aviation Imports

Pratt & Whitney Engines published last week that this report is \$5.5 million worth of new aircraft in 1975 while exporting \$5.5 million more.

Sycamores Go to Congo

Belgian Air Force has ordered three Bristol Sycamore copters, the *Financial Times* reports.

The copters, intended for movement of wounded and for rescue operations, will be sent to the Congo lake at Kinshasa, Belgium's chief military establishment in Africa.

The Sycamore is powered by a 516 hp Alvis Lionard engine; rates has 40-ft 6-in. diameter.

AVIONICS

Avionic Heat Problem Becomes Critical

- Mechanical cooling hikes airplane weight, cost.
- Airframe makers weigh redesign, repackaging.

The problem of cooling avionic equipment in high-speed aircraft has become so critical that airframe manufacturers may be forced to redesign and repackaging equipment received from avionic manufacturers. Such a move could have the cooling effects.

This warning, issued by E. W. Caswell of Douglas Aircraft Co. at the recent Institute of the Aeronautical Sciences meeting in Los Angeles, is no idle threat. For its top new A-10 attack bomber, Douglas repackaged a UHF transmitter, automatic direction finder, and IFF into a pressurized container (shown right, in) for its latest cooling, and redesigning where necessary to eliminate duplicate cooling.

The result was that avionic equipment weight was cut from 175 lb. to 121 lb., volume was cut from 9,200 cu. in. to only 5,100 cu. in., Caswell said.

- Alternatives—The alternatives, which Caswell outlined, are for avionic case factors to:
- Provide more thermal data, sooner, so that equipment meets a variety of operating conditions.
- Improve thermal design of equipment for better cooling.
- Increase chemical efficiency to reduce power consumption, not heat losses.
- Reduce mechanical operating frequency of equipment.

Caswell reported that USAF and Navy are investigating the problem of getting more data on thermal characteristics of avionic equipment for avionic manufacturers.

► **The Problem:** The amount of self-generated heat within avionic equipment has grown from 100 watts to 1,000 watts with their growing size and higher power.

Approximately 90% of a device's thermal input power is dissipated in heat. Caswell said. An ideal position, in single-engine aircraft is that avionic equipment is heavily exposed to jet engine heat.

Meanwhile, aircraft speeds have reached the point where heat is no longer an effective coolant. At sea level, air temperature is 200° at Mach 1.5 and 300° at Mach 2.

► **Self-Protection:** The obvious solution is



TO HELP KEEP AIRBORN, Douglas redesigned avionic equipment self-protection.



PRESSURIZED CONTAINER inside which engine 30 Hercules launch a Douglas-designed engine replacing "black box" in background. Weight saving more than 50 lb.

to protect the engine from heat. Caswell reported a Douglas analysis which showed that for a much smaller heat sink, such a device is more cost-effective than the current design.

- 15 lb. of cooling equipment
- 100 lb. of extra engine fuel per hour to cool the cooling system
- The direct weight penalty for a small jet with its low levels of engine heat and one hour's flight endurance is (15 + 30) times 10, or 150 lb.

► **Add the Growth Factor:** When avionic equipment is added to the base, the entire aircraft's performance is compromised as its gross weight must be increased to maintain the same capability. Douglas notes of this

growth factor shows that it varies by twice a factor of four, for older propeller aircraft, so as high as 10 for some jet fighters.

Using an average growth factor value of 10 for the above report, the addition of 15 lb. of cooling equipment increases engine gross weight by 1,500 lb., Caswell said, if the same problem were to be repeated. Based on an average manufacturing cost of \$40/lb., this increases engine cost by approximately \$60,000.

Douglas El Segundo designers have this cost a much too high, Caswell said. Here are some of his suggestions for solving the problem:

► **More Data Needed:** At present, it is not clear how much data is needed to



New Douglas Design Center

Douglas Aircraft Co.'s new \$10-million aircraft design center at 80 Sycamore, Calif., features a rooftop helipad which will be used to transport engineers to surrounding test areas.

and other Douglas plants. The 210,000-ft. steel and concrete building is the new home of chief engineer Edward Henneman and his 1,000 team members.

► **Amesbury Glass West**—We're not just that there are many interesting "Casualty" stories behind the workroom window industry on the West Coast. A couple of smart engineers let upon an idea, build a prototype in a basement machine shop, get some financial backing, and now are in business. During the last two weeks of August and first week of September, Amesbury Glass' aviation dealer will be on the West Coast and would like to hear from new companies who tell they have a "Casualty" story to tell. Write to Philip Klein, Amesbury Glass, 1111 Wilshire Blvd., Los Angeles.

► **Shaded Tube Test**—New Schenck constant shaded tubes (Amesbury Glass Inc. 35, p. 81) may get a service shake-down test in a limited number of selected applications where their performance can be easily measured. Navy is presently considering such a program using shaded 535 tubes.

► **Reliable Mag Amps**—Availability of Westinghouse W-34, subminiature 7500's in reportedly running between 95% and 95%, a company source of USAF bases shows, which speaks well for the reliability of mag amplifiers used in the W-34.

► **High Power Silicon Rectifier**—A high-temperature silicon rectifier rated at more than 1,000 watts has been developed by Westinghouse Electric.

► **Transistorized Digital Computer**—Bell Telephone Labs have constructed an experimental all-transistor (except the clock power supply) digital computer, called Tangle, under USAF sponsorship. Machine operates in serial fashion at a 1 ms pulse rate using 16 digit binary numbers. Tangle can add and subtract in 35 microseconds; divide and multiply in 100 microseconds. Total power consumption is under 100 watts, an important factor similar to cooling is considered.

► **Tangle Power Reliable**—In two weeks of continuous 24 hours a day operation, Bell Labs' Tangle (transistorized digital computer) suffered only two power-line failures of the catastrophic type, as failures of resistors, capacitors, transistors in a way of 113,000 detected. R. H. Harris told the recent Defense airborne electronics conference. Eight transistors were replaced during this period as a result of preventive maintenance. This good record indicates that transistors are there for voltage events, hold considerable promise for improving computer reliability. —PK

NEW AVIATION PRODUCTS



MACHINE sands auger-type tube being fed into Aero Commander cooling.

Flexible Shaft Machine Sands, Grinds, Drills

New truck-mounted flexible-shaft sand chaser can be used by aerial operators for stranding, balling, wire brushing or grinding solids. It can also be used for drilling in wood and steel.

The C-30 is mounted on large black for size movement over rough ground. The 4-in. flexible shaft is 6 ft long. Unit comes with either a 4 or 11 hp motor, and can operate at 1,150, 1,140, 5,000 or 5,710 rpm.

Stee Manufacturing Co., 441 State St., Binghamton, N. Y.



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The accompanying photo shows a 12-in. clamp (part 545) being used in connection with a vertical drilling machine. In addition to drill parts work, it can be used with milling machines, boring mills etc., and can be

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The clamp is used to give 3,000 psi equivalent pressure by means of the lever wheel.

Silber-Adjustable Hold-Down Clamp Co., 640 Albany St., Rossmore, Ca.

New Thermocouple Clamp Made Corrosion-Resistant

A new thermocouple clamp incorporates a heat-treated thermocouple covered by a thin-walled Teflon tube. The tube is used to provide protection against corrosion.



TEFLON TUBE covers thermocouple.

The new clamp Model TC-147, offers the corrosion resistant properties of Teflon in a fast-expanding thermocouple with average thermal-line constant of 4.5 microvolts per degree Fahrenheit per inch.

General Electric, 415 S. Main St., Buffalo, N. Y.

ALSO ON THE MARKET

New X-ray inspection unit is light weight, self-contained and portable. Model MG 50 is designed for continuous operation and is used to detect for non-destructive applications. X-ray tube has a small (1 mm) focal spot—North American Philips Co., Inc., Research and Development Division, 710 S. Fulton Ave., Mt. Vernon, N. Y.

Spially styled Teflon tube for color coding and current identification is now available in production quantities. It meets military and commercial specs for color coding, which is available in 519 different combinations, using black, brown, red, orange, yellow, green, blue, purple or grey in control or white in isolation. Finished wire is supplied in conductor sizes from No. 26 to 10 awg. Teflon insulation meets military spec for Type E wire used for operation at 500 v and 250°C.—Toshiba Insulated Wire Co., Inc., 145 Main St., Tarrytown, N. Y.



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BEECHCRAFT ARE THE AIR PART OF AMERICAN BUSINESS

CAB May Revamp U.S.-Alaska Routes

- Examiner Brown made the following recommendations to CAB:
- Pacific Northwest's democracy (or



Whetstone and Education is not required unless NWAC's authority to conduct forest audits over this issue is

► **NWA Eliminations:** In addition, the bureau plans would eliminate Northwest from the Anchorage market, which the

• Eliminate Alaska Airlines from the States-Alaska market for which the carrier has received mail pay of \$2,786,582 in the slightly more than five years of its operation.

New York Airways inaugurated the first scheduled helicopter commuter service Aug. 3, operating two flights daily from Trenton, Princeton and New Brunswick, N. J., to New York.

They can shift letters of registration through transfer of stock ownership of the corporate holding each letter; they can change corporate officers and partnership members; they can buy, sell,

► **'Hollow Gesture'**—His testimony before the Senate commission, Griffith said, the Compliance Office's chief problem is that if it is successful in convincing



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have had experience with the reliability and limitations of the helicopter.

Industry participants will use of helicopters by private owners, particularly commercial concerns, and the establishment of private heliports at such places as factories and hotels. Local planning and expenditures should take this into consideration.

For the future transport helicopter, presumably a twin-engine aircraft, safety will demand that the pilot in aircraft always be in a position to continue flight or land safely if one engine fails.

Because a helicopter requires 65 to 90% of available power to hover, it is clear that it cannot hover with one engine out at normal gross weight. This means the pilot must have forward speed to stay in the air and under control. To have forward speed on takeoff, he must be able to fly over a clear access path. The correct take-off straight-up and level-off high, steady obstructions without endangering his passengers.

Based on limited experience to date, it appears that obstruction lights, an illumination beacon and lights to indicate the touchdown pad will be needed for night operations.

Single-engine helicopters will not be allowed to fly under IFR conditions. For multi-engine operations, some type of rules will be needed to mark the access path to a destination heliport. In addition, there must be a licensee to help the pilot find the landing spot. It must be more accurate than present airport equipment.

Chairman of the helicopter subcommittee that compiled the report is John F. W. Vest of the Military Division, United Aircraft Corp. Other members: Elwyn Woodard, Bell Aircraft Corp.; L. S. Wedgwood, Fawcett-Rich; George C. Neal, Propex; and Neil Don Rosa, Moller and Jim Ross Howard, both of AIA.

EAL, NWA Propose Interchange Service

Eastern and Northwest Coast Airlines are seeking Civil Aeronautics Board approval for an interchange to provide one-plane service from Minneapolis-St. Paul to Milwaukee, Atlanta, Tampa and Miami.

Northwest would use its equipment during the winter months and Eastern during the summer months, thus covering the seasonal variation in their traffic by making maximum use of their equipment.

The two airlines want to use Chicago as the interchange point. The only existing single-plane service between the two areas now is the National-Capital package, which runs Washington, D. C., to its connecting point.

BOAC Agrees to Buy UAL Stratocruisers

British Overseas Airways Corp. has agreed to buy six Boeing Stratocruisers from United Air Lines and is expected to put the airplanes in its passenger fleet. Contact 1 jet transport fleet on trans-Atlantic flights only next summer (Aircraft Week July 25, p. 19).

The six transports made up UAL's entire Stratocruiser fleet.

The British airline now is talking to local regulations with Pan American World Airways for two additional Stratocruisers.

First, 749-B in London, BOAC has taken delivery on the first of four Lockheed Constellation 749s purchased from Qantas Empire Airways. It probably will go into service this month on routes to Africa and the Far East.

The airline also has bought one Constable from Lockheed Aircraft Corp., Burbank, Calif.

No follow-up BOAC has not been able to find an airline that will take additional 749s needed to supplement its fleet with the Constables are put back into service and British Overseas Airways is on order are delivered.

The British air carrier plans to send its Constables to Const 35 and 36 are delivered or if its grounded Strats are cleared to resume service. The Stratocruisers will be replaced by Britannias.

EAL Asks Approval Of Mexico City Route

Eastern Air Lines wants Civil Aeronautics Board to issue a "facility order" affirming the validity of EAL's New Orleans-Mexico City route, in question since 1952.

Filed in the proceedings on American Airlines' application for nonstop service between New York and Mexico City, Eastern's petition contends that none of the parties involved in the ongoing service proceedings can determine what type of case to present until the issue of the validity of EAL's Mexico City route is resolved.

Eastern has been authorized to serve Mexico through New Orleans since 1946. But because of the failure of U. S. and Mexico to work out a reciprocal air transport agreement, Eastern has been unable to begin its service.

President Truman in 1952 revoked EAL's Mexican authorizations by letter. Eastern has refused to recognize such revocation on the grounds that the specific language in the Civil Aeronautics Act prohibits cancellation of a certificate for foreign air transportation without cause and without notice and hearing.



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CAB ORDERS

(July 31/75)

DECEASED

Bureau Air Lines' motion for reconsideration of past orders showing consideration of orders due to its (Stewart) financial application for renewal of its awarded on status of public convenience and necessity. **American Transport** has its reconsideration petition that asked additional operational authority for its members and other airlines similarly situated.

APPROVED

Interim arrangements between Northeast Central Airlines and Lake Central Airlines and various other air carriers. **Five minutes** used by Traffic Conference 2 of the International Air Transport Association for American World Airlines and various other domestic and foreign air lines.

GRANTED

Transwest Air Lines an exemption to operate 10 nonstop flights from Denver to Tulsa, carrying 5-6 airlines personnel and cargo workers. **Midwest Airlines** a temporary exemption to permit helicopter operations through two, rather than one, airports in serving Liberty-Monroeville, N. Y.

Flying Turkish Airlines an exemption to operate one flight from Stockholm, Sweden, to New York Aug. 17 and three flights from Miami, Caracas, to New York Aug. 24, Sept. 14 and Sept. 21 under contract with Intercontinental Consortium for European Migrants.

ORDERED

Procter Airlines' certificate amended by extending Route 13 from Baltimore, Md., to Brunswick, Maine, M. D., via the airports and points of Miles City and Cheyenne, Wyo., and the alternate intermediate points of Sidney and Wolf Point, Mont., and Wilkes and Dickinson, N. D., until Mar. 31, 1977.

SUSPENDED

S. W. Lee, individual exemption to an irregular airline under the carrier files before AEC. 10 credits delinquent reports required for the first quarter of 1974.

SPECIAL NOTE

CAB June 16 and it was issuing an order suspending operation of Stewart Air Service, Hawthorne, Calif., as an irregular air line effective July 1. On June 25, however, the company filed Schedule F of CAB Form 242 for first quarter of 1974, which had been delinquent since May 20. CAB did not directly suspend the operation, as planned. No order was issued as the effect and none will be.

CORRECTION

A CAB order relating to Portland Area routes Corp appearing in *Aviation Week*, July 26, p. 51, was incorrect. It should have read:

Extended Portland Area routes Corp in-

ception to operate charter trips until 60 days after Board action decision on Portland application for a certificate of public convenience and necessity as a charter operator. **Aviation Week** again the accuracy.

SHORTLINES

American Airlines reports a company record of 165,648,000 revenue passenger-miles for June, compared to 145,596 for June 1974, and 318,876,000 and well ahead of last May's total of 125,065,000. Airfares declined 9.6% over June 1974 to \$4,578.450 per month, but air expenses dropped 19.6% to 68,550.

British European Airways' chief executive Peter Macfield, predicts the airline will continue flying to and out of London Airport will total the (airline's) total of all other airlines by the summer of next year.

British Overseas Airways Corp. will begin operating a new "Oceanic" transatlantic service Sept. 4, flying one roundtrip a week between New York, Montreal and Chicago via London and Frankfurt, Germany.

California Central Airlines is selling first-class and second-class tickets on a "baggage" credit plan.

Delta-CGS Air Lines has 29,500,000 revenue passenger-miles during June, a gain of 4.8 million miles over the same month last year. Available seats were increased 20% to 45,140,080.

Eastern Air Lines reports its "air new, play later" package vacation sales have increased 367% over last year, reports trips to total 58,000 before Dec. 15.

Oriskany Air Lines reports it gained 54,221 as passenger en route from Baltimore City, Md., to New York from May 15 to July 15, first 60 days of service.

Pan American World Airways reports 54,063 aircraft passengers en route on Caribbean routes during June, an increase of 24% over the same month last year.

Renold Airlines says its revenue is more than 60% ahead of last summer's volume. The carrier plans to continue its contract this fall at no increase in rates.

Scandinavian Airlines System expects to open its "over the pole" route from Europe to Los Angeles Oct. 1.

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AVIATION WEEK, August 8, 1974

Intercity Travel 'Saturation'?

Note to aviation statisticians:

Thinking of the future strictly in terms of the past? It's almost as misleading as aviation as painting the future in terms of the present.

No plane be careful in comparing those saturation points in intercity travel and shipping. Some of your landings are encouraging advice people to propose higher fares, to talk about a little more subsidy here and there, to pass the buck from the rules departments almost anywhere else, discouraging healthy competition where a little more might be in order, to increase cargo rates where competition will permit, to cut there where competition is tough. Some dire scenarios will come, and may be accurate, but it's a dangerous move that our discourage needed new enterprises.

Your forebodings about saturation points on two of obviously encourage the theory that no matter how much selling and sales promotion commercial air transport puts forth, the result will be some pre-determined and theoretical total of new business and that's all. So why try too hard?

Technical developments and streamlining are unquestioned left to public acceptance of commercial flight. The duty files of Civil Aeronautics Board are filled with conservative prognostications of traffic that would be between reported cities if service were permitted. Many a statistic for air was based mainly on the historical traffic by rail between the same points, and a modest suggestion that air might capture some of this haul. In most cases the airlines have not only upstaged a big chunk of the railroad business, but they have created traffic the statisticians never dreamed of.

There were about 15,000 motor cars in this country in 1901 and there was plenty of opinion (and statistics to prove it) that expecting anything to come out of the horseless carriage movement was foolhardy. Obviously, activity travel had scarred its results.

In 1912, the plan for a \$10,000-mile national system of highways was interpreted widely as a frivolous expenditure of public funds for the benefit of a few wealthy pleasure seekers. Since for long-distance freight transportation it is impossible for trucks over any road surface to compete with the low cost of hauling on a railway," as the respected Engineering News-Record said at that time.

Now there are millions of miles and trucks in this country and TWA's president Ralph Dueson recently cited an estimate of passenger miles traveled in private cars in 1952 at something like 190.7 billion, which was a gain of 95% from as recent as year in 1940!

Public mobility has reached a fabulous stage because the motor car brought inexpensive, dependable and comfortable transportation, and can now be competitively manufactured, sold and promoted by the vigorous auto industry. The motor car created travel on a scale that would have been unbelievable 25 years ago.

Now, again, we are beginning to hear the statisticians definitely talking about saturation points of intercity travel but very little consideration is being given to these statistics to the impact of hard selling and technical improvements.

Saturation alone are not enough, misdirection and optimism and faith in true enterprise are needed, too. A Twentieth Century Fund survey, made in 1947 by J. Fredrick Dehnbart & Associates ("America's Needs & Resources") says it well:

"Look of imagination has characterized most presentism in forecasting the future of transportation, but even accurate forecasts of future changes were not with national accelerator. At best, then, there is the difficult choice of being considered feeble-minded soon or later." The statisticians certainly allow the future to take care of itself.

Mr. Dueson, one of the hard-headed optimists in this business, must have known last January TWA soon would be operating about half of its mileage in pre-scheduled air tourist schedules in a bold drive to capture new customers from competitors on the ground or in the air, or to create new business where none had existed before. The industry's recent record of seats available over main sold, due to rapid deliveries of big, new transports, also was interpreted by Mr. Dueson. "But he put it in proper light in his forecast last January, when he pointed out we would have 'a temporary case of equipment indignation.' Mr. Dueson obviously is not ready to listen to theories on intercity travel saturation. "We in this industry are going to sock a very busy baby during 1954," he reported. "So far, it is very, very right, and this is no time to start singing the blues or stop driving to broaden the base of our market and attracting new customers."

ALPA's Mistake

No other aviation publication has repeated so fully the views and activities of the Air Line Pilots Assn. No other aviation magazine has expressed so much hope in the present administration of ALPA under Clency Sykes. No other air magazine devotes space to a regular column written by an ALPA member. But Aviation Week can find little sympathy for ALPA's strike against American Airlines, either in aviation or among the public. We disagree with ALPA.

Any union must combat what it considers a creeping encroachment at its benefits. But the night-hour rule became effective about 1931, and it seems to us that the vast improvements in working conditions and salaries of air-line pilots since then merit some special consideration by ALPA for special considerations such as those involving verifiable coast-to-coast transcontinental flights. There may have been ways to protect ALPA, as well as American Airlines. There must have been other alternatives short of a strike. Obviously, our view is that the American strike was unnecessary at this time, and a major mistake.

—Robert H. Wood

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